Dietary Effects on Conjugated Linoleic Acid Content of Cows' Milk

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Introduction

Conjugated linoleic acid (CLA) is an intermediate compound of biohydrogenation of linoleic acid in the rumen. Conjugated linoleic acid has been shown to have anticarcinogenic properties and possibly other effects that would be positive for human health. Two experiments were conducted to determine the content of CLA in milk of cows grazing pasture (Experiment 1) or those fed conserved forages (Experiment 2).

Materials and Methods

Experiment 1. Fifty-three cows were randomly assigned before calving to one of three treatment groups. Cows calved between March and May of 1995. From early May until the end of September cows grazed a permanent pasture (P) containing a mixture of grass and legume species. During the grazing season, cows in the three treatment groups consumed either 1/3, 2/3, or all of their daily feed from the pasture. The balance of feed for the 1/3 P and 2/3 P groups was supplied by a supplement. The supplement for the 1/3 P group contained (DM basis): alfalfa hay 25%, high oil high moisture ear corn (HOHMEC) 48.3%, soybean meal 6% and roasted soybeans 18%. The supplement for the 2/3 P group contained: alfalfa hay 50%, HOHMEC 28.4%, and roasted soybeans 18%. Milk samples were collected from 18 cows (6 in each group) during the month of August and from 35 cows (12, 11 and 12 cows in 1/3 P, 2/3 P, and P groups) during September. Milk samples were analyzed for fatty acid composition.

Experiment 2. Fifty-three cows were randomly assigned before calving to either normal corn (NC) or high oil corn (HOC) treatments. From wk 3 to 24 of lactation, cows in the NC treatment were fed diets containing normal corn silage and normal high moisture ear corn, whereas cows in the HOC treatment received high oil corn silage and HOHMEC. Diets contained (DM basis): alfalfa silage 27.5%, corn silage 22.5%, HMEC 31.5%, soybean meal 10%, roasted soybeans 4.6%, and blood meal 2%. After 10 weeks or more of feeding the experimental diets, milk samples were collected twice from 12 cows (6 in each treatment) and analyzed for fatty acid composition. Fatty acid profile of feed ingredients is in Table 1.

Results

The CLA and total unsaturated fatty acid contents in milk were higher in the P group compared with the 2/3 P and 1/3 P groups in experiment 1 (Table 2). In experiment 2, the fatty acid composition of the milk was similar for both groups. The CLA content was 3.7 and 4.0 mg/g of milk fat in the normal corn and high oil corn groups, respectively.

Summary

Milk from cows grazing pasture had higher CLA content than milk from cows fed conserved diets containing 50:50 forage and grain.

Table 1. Fatty acid composition of feed ingredients (Fatty acid, mg/g fat).

Ingredient	C14:0	C16:0	C18:0	C18:1	C18:2	C18:3	Others
Alfalfa hay	7.3	251.6	32.1	26.1	150.2	230.2	302.6
Alfalfa silage	12.2	172.4	28.8	45.5	202.3	301.8	237.0
Normal corn silage	6.4	142.8	25.9	212.8	487.8	41.6	82.7
High oil corn silage	2.7	123.5	29.9	254.0	470.5	25.7	93.6
Pasture grass	9.9	132.2	23.9	34.0	159.1	410.8	230.0
NHMEC	2.2	120.6	19.4	264.2	537.9	14.7	41.1
HOHMEC	.6	109.4	24.1	312.2	461.9	9.4	82.4
Soybean meal	2.5	151.6	43.4	136.9	524.7	90.1	50.9
Roasted soybeans	1.4	104.5	40.8	224.4	512.6	85.3	31.0
Blood meal	30.4	221.6	166.9	244.5	97.8	9.8	229.0

Table 2. Fatty acid composition of the milk (mg/g of fat)[1].

	Experiment 1					Experiment 2			
Fatty acid	1/3P	2/3P	P	SEM	*P*	NC	HOC	SEM	*P*
C10:0	20.3	18.9	18.9	1.5	.6	30.3	26.7	.7	.2
C:12:0	24.5	23.0	21.9	1.0	.09	40.8	34.7	.9	.2
C14:0	91.0	91.0	88.4	2	.08	130	119	2	.3
C16:0	243	245	251	5	.2	330	302	7	.5
C:16:1	12.6[b]	13.1[b]	18.0[a]	.5	.02	17.1	14.7	.7	.5
C18:0	153	159	123	6	.07	93	118	3	.2
C18:1	303[b]	311[b]	331[a]	7	.001	203	232	5	.4
C18:2	42.7[a]	31.4[b]	16.6[c]	1	.003	35.0	35.6	.9	.15
CLA[2]	8.4[c]	13.7[b]	22.7[a]	.9	.0002	3.7	4.0	.2	.9
C18:3	8.2[c]	13.5[b]	16.5[a]	.2	.001	7.6	7.4	.1	.5
Others	93	80	92	7	.4	109	106	2	.9

[1]Means in the same row with different superscripts differ (*P* as indicated).

[2]Conjugated linoleic acid (cis 9, trans 11).